IN THE CLAIMS:

1. (Original) A two-stage hybrid cryocooler comprising:

a first-stage Stirling expander comprising

a first-stage regenerator having a first-stage-regenerator inlet and a first-stage-regenerator outlet;

a second-stage pulse tube expander comprising

a second-stage regenerator having a second-stage regenerator inlet in gaseous communication with the first-stage-regenerator outlet, and a second-stage regenerator outlet,

a pulse tube having a pulse-tube inlet in gaseous communication with the second-stage regenerator outlet, and a pulse-tube outlet, wherein the second-stage regenerator and the pulse tube together provide a first gas-flow path between the first-stage regenerator and the pulse-tube outlet,

a pulse tube pressure drop structure having a pulse-tube-pressure-drop inlet in gaseous communication with the pulse-tube outlet, and a pulse-tube-pressure-drop outlet, and

a gas volume in gaseous communication with the pulse-tube pressure-drop outlet; and

a gas flow shunt providing gaseous communication between the first-stage regenerator and the pulse-tube outlet, wherein the gas flow shunt provides a second gas-flow path between the first-stage regenerator and the pulse-tube outlet.

2. (Original) The hybrid cryocooler of claim 1, wherein the gas flow shunt provides gaseous communication between a first-stage regenerator location at which a gas temperature is substantially the same as the gas temperature at the pulse-tube outlet, and the pulse-tube outlet.

3. (Original) The hybrid cryocooler of claim 1, wherein the gas flow shunt

provides gaseous communication between the first-stage regenerator outlet and the pulse-tube outlet.

4. (Original) The hybrid cryocooler of claim 1, wherein the pulse-tube outlet is maintained at the same temperature as the second-stage regenerator inlet.

5. (Original) The hybrid cryocooler of claim 1, wherein the pulse-tube outlet is maintained at the same temperature as the second-stage regenerator inlet and wherein the gas flow shunt provides gaseous communication between the first-stage regenerator outlet and the pulse-tube outlet.

6. (Original) The hybrid cryocooler of claim 1, wherein the gas flow shunt provides gaseous communication between the first-stage regenerator inlet and the pulse-tube outlet.

7. (Original) The hybrid cryocooler of claim 1, wherein the pulse-tube outlet is maintained at an ambient temperature.

8. (Original) The hybrid cryocooler of claim 1, wherein the pulse-tube outlet is maintained at an ambient temperature, and wherein the gas flow shunt provides gaseous communication between the first-stage regenerator inlet and the pulse-tube outlet.

9. (Original) The hybrid cryocooler of claim 1, wherein the second gas-flow path has a flow capacity of from about 5 to about 30 percent of the first gas-flow path.

10. (Original) The hybrid cryocooler of claim 1, wherein the gas flow shunt comprises

a flow-resistance control structure.

11. (Original) The hybrid cryocooler of claim 1, wherein the gas flow shunt comprises

a passive flow-resistance control structure.

12. (Original) The hybrid cryocooler of claim 1, wherein the gas flow shunt comprises

an active flow-resistance control structure.

13. (Currently amended) ~~The hybrid cryocooler of claim 1~~ A two-stage hybrid cryocooler comprising:

a first-stage Stirling expander comprising

a first-stage regenerator having a first-stage-regenerator inlet and a first-stage-regenerator outlet;

a second-stage pulse tube expander comprising

a second-stage regenerator having a second-stage regenerator inlet in gaseous communication with the first-stage-regenerator outlet, and a second-stage regenerator outlet,

a pulse tube having a pulse-tube inlet in gaseous communication with the second-stage regenerator outlet, and a pulse-tube outlet, wherein the second-stage regenerator and the pulse tube together provide a first gas-flow path between the first-stage regenerator and the pulse-tube outlet,

a pulse tube pressure drop structure having a pulse-tube-pressure-drop inlet in gaseous communication with the pulse-tube outlet, and a pulse-tube-pressure-drop outlet, and

a gas volume in gaseous communication with the pulse-tube pressure-drop outlet; and

a gas flow shunt providing gaseous communication between the first-stage regenerator and the pulse-tube outlet, wherein the gas flow shunt provides a second gas-flow path between the first-stage regenerator and the pulse-tube outlet, wherein the gas flow shunt comprises

a biased-flow-resistance control structure, wherein a pressure drop through the gas flow shunt is larger when a working gas flows therethrough toward the pulse-tube outlet than when the working gas flows therethrough away from the pulse-tube outlet.

14. (Original) A two-stage hybrid cryocooler comprising:

a first-stage Stirling expander comprising

a first-stage regenerator having a first-stage-regenerator inlet and a first-stage-regenerator outlet;

a second-stage pulse tube expander comprising

a second-stage regenerator having a second-stage regenerator inlet in gaseous communication with the first-stage-regenerator outlet, and a second-stage regenerator outlet,

a pulse tube having a pulse-tube inlet in gaseous communication with the second-stage regenerator outlet, and a pulse-tube outlet, wherein the second-stage regenerator and the pulse tube together provide a first gas-flow path between the first-stage regenerator and the pulse-tube outlet, and wherein the pulse-tube outlet is maintained at the same temperature as the second-stage regenerator inlet,

a pulse tube pressure drop structure having a pulse-tube-pressure-drop inlet in gaseous communication with the pulse-tube outlet, and a pulse-tube-pressure-drop outlet, and

a gas volume in gaseous communication with the pulse-tube pressure-drop outlet; and

a gas flow shunt providing gaseous communication between the first-stage regenerator outlet and the pulse-tube outlet, wherein the gas flow shunt provides a second gas-flow path between the first-stage regenerator and the pulse-tube outlet, and wherein the second gas-flow path has a flow capacity of from about 5 to about 30 percent of the first gas-flow path.

15. (Original) A two-stage hybrid cryocooler comprising:

a first-stage Stirling expander comprising

a first-stage regenerator having a first-stage-regenerator inlet and a first-stage-regenerator outlet, and wherein the first-stage regenerator inlet is maintained at an ambient temperature;

a second-stage pulse tube expander comprising

a second-stage regenerator having a second-stage regenerator inlet in gaseous communication with the first-stage-regenerator outlet, and a second-stage regenerator outlet,

a pulse tube having a pulse-tube inlet in gaseous communication with the second-stage regenerator outlet, and a pulse-tube outlet, wherein the second-stage regenerator and the pulse tube together provide a first gas-flow path between the first-stage regenerator and the pulse-tube outlet, and wherein the pulse-tube outlet is maintained at ambient temperature,

a pulse tube pressure drop structure having a pulse-tube-pressure-drop inlet in gaseous communication with the pulse-tube outlet, and a pulse-tube-pressure-drop outlet, and

a gas volume in gaseous communication with the pulse-tube pressure-drop outlet; and

a gas flow shunt providing gaseous communication between the first-stage regenerator inlet and the pulse-tube outlet, wherein the gas flow shunt provides a second gas-flow path between the first-stage regenerator and the pulse-tube outlet.

16. (Original) The hybrid cryocooler of claim 15, wherein the second gas-flow path has a flow capacity of from about 5 to about 30 percent of the first gas-flow path.